SECTION 2. MODIFICATIONS TO THE DRAFT TEF EIS

This section presents the technical modifications to the Draft TEF EIS in the format described in the Foreword. The changes are made to (1) incorporate responses to comments received during the public comment period; (2) correct or clarify factual information; and (3) reflect TEF, CLWR, and APT design concepts developed since the Draft EIS was issued. The changes are presented in the same order (by chapter) the information was presented in the Draft EIS.

Chapter 1. Modifications – Background and Purpose and Need for Action

As explained in greater detail on page S-2 of this EIS, DOE has modified the sections on Purpose and Need to clarify the decision process and the purpose for the proposed action evaluated in this EIS. Please refer to page S-2 in this Final EIS for the revised description of Purpose and Need for Action. This modification also applies to Section 1.3 on page 1-3 of the Draft EIS.

In Section 1.5, Related Department of Energy Actions on page 1-4, the Draft EIS describes the Record of Decision for the Tritium Supply PEIS and the necessity to prepare related site-specific evaluations under NEPA. The following text is reproduced from the Draft EIS and introduces Figure 1-3 which has been updated.

As mentioned in Section 1.1, the Record of Decision supported by the Tritium Supply PEIS has resulted in a series of actions by DOE which require site-specific evaluations under NEPA. These actions are the purchase or use of a CLWR to make tritium, the construction of a new tritium extraction facility at SRS (this EIS), the upgrade and consolidation of SRS tritium facilities (DOE 1997a), and the APT (DOE 1998a). APT with its preferred feedstock of helium-3 would not require the tritium extraction processes in TEF; however, TEF could be built as a backup to process alternative APT targets or CLWR targets if necessary. Because of the relationships among these proposed actions related to tritium supply and recycling, DOE is closely coordinating the range of the proposed actions and the schedules for preparation of NEPA documents (Figure 1-3).

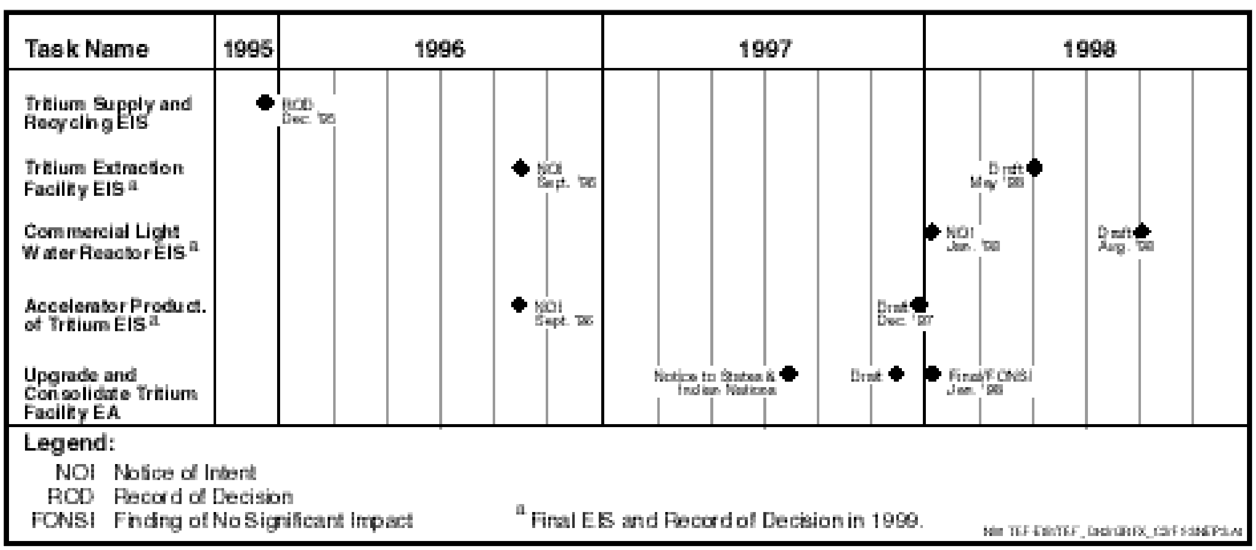

Figure 1-3. NEPA documentation for related DOE actions.

If the Secretary selects the CLWR option, DOE would transport the irradiated targets from the reactors to SRS for tritium extraction. Impacts of transporting irradiated targets from the commercial reactor to TEF will be discussed in the CLWR EIS. **The potential impacts of tritium-related transportation on or near the SRS are being addressed in the CLWR EIS**.

Chapter 2. Modifications – Proposed Action and Alternatives

In Section 2.4, Comparison of Environmental Impacts Among Alternatives Considered, on page 2-8 the Draft EIS presents a comparison of the environmental impacts among the alternatives. In this Final EIS, Table 2-2 on pages 2-3 to 2-8 compares the increment of the impacts of the proposed action and its alternatives to the current conditions at the SRS. Table 2-3 on page 2-11 compares the impacts of incorporating tritium extraction capabilities into APT to those associated with the construction and operation of APT without the tritium extraction capability. Since the Draft TEF EIS was issued, DOE has updated the information for operating APT in accordance with both the stand-alone APT and the APT with extraction capability design variation. The following text and tables are revised based on the updated operational information.

2.4 Comparison of Environmental Impacts Among Alternatives Considered

This section is based on the information in Chapter 3, Affected Environment, analyses in Chapter 4, Environmental Impacts, and **data prepared for the** APT **Final** EIS (**England 1998a; Willison 1998**). Its purpose is to present the impacts of the proposed action and the alternatives in comparative form to provide a clear basis for choice for the decisionmaker(s) and the public.

Table 2-2 **on pages 2-3 to 2-8** compares the increment of impacts of the proposed action and the alternative to construct and operate TEF at AGNS to the SRS baseline, which represents current conditions at the SRS as detailed in Chapter 3. Where applicable, impacts from all natural, existing causes or regulatory standards or current impacts from existing causes are provided as a perspective on the severity of baseline conditions and incremental impacts of the alternatives. Table 2-2 also presents the incremental impacts of incorporating TEF in APT (this EIS's no-action alternative).

In general DOE considers the expected impacts from the proposed action or its alternatives on the physical, biological, and human environment to be minor and consistent with what might be expected for an industrial facility. Impacts of the proposed action, the AGNS alternative and the no-action alternative are detailed in Table 2-2 and subsections 2.4.1 and 2.4.2. **In the comparison of impacts, DOE determined that changes from the baseline of less than 5 percent are within the margin of error and the conservatism inherent in the analyses. Therefore, DOE finds that in those instances there would be no measurable change from the baseline and has not evaluated the impacts further.**

Compared to the proposed action, the AGNS alternative **is projected to have a 0.13 millirem higher** radiation dose at the site boundary (due to **its closer** proximity to the boundary) but **nearly equal collective** population doses. The estimated radiation doses were used to predict whether any latent cancer fatalities would be associated with either normal operations or potential accidents. Construction waste at AGNS would be less because putting TEF at AGNS would involve refurbishing existing facilities, rather than the total construction of TEF at H Area. Slightly higher sanitary waste would be generated at AGNS during operations due to a larger workforce.

Many of the incremental impacts of the no-action alternative are less than those of the proposed action, because the combined tritium extraction and accelerator production of tritium processes would **have shared** land, components, and infrastructure that would be duplicated if each were developed as an independent facility. Table 2-2 demonstrates reduced impacts from the no-action alternative to geology, surface water, groundwater, nonradiological air emissions, hazardous waste generation, aesthetics socio-economics, environmental justice, construction worker injuries, anticipated and unlikely accidents, and ecological resources.

Table 2-2. Comparison of the alternatives for construction and operation of TEF.

Resource	Current SRS Baseline	Increment above baseline of proposed H Area site	Increment above baseline of alternative AGNS site	Increment above baseline of no-action alternative[a,b,c]
Schedule and Operating Parameters				
Construction	TEF is not built	5 years	5 years	No change in the period of construction for APT.
Annual electricity		20,600 Mw-hrs (CLWR targets) <19,570 Mw-hrs (targets of similar design)	Same as H Area	Less than 5 percent of baseline defined for no action. See footnote (b).
Annual sanitary wastewater (gallons)		770,000	1,200,000	No change from APT's baseline.
Annual radioactive process wastewater (gallons)		11,000	Same as H Area	11,000 (8 percent increase in APT's baseline).
Impacts to the Physical and Manmade Environment				
Geology	Existing sites are cleared and graded; grassed, paved or graveled; and used for industrial purposes	Minimal construction impacts through application of best management practices and compliance with Federal and state regulations.	Lower construction impacts than H Area because of less construction at AGNS.	No effects greater than 5 percent above APT's baseline. See footnote (b).
Groundwater		Minor dewatering during construction activities near or below the water table. Design would prevent process water migration into the groundwater during operations.	Facilities near the water table are in place and protected (fuel storage pools are doubled-walled stainless steel tanks with leak-detection systems).	No effects greater than 5 percent above APT's baseline.
		With an immediate response by SRS to contain and remediate spills, it is unlikely that a spill would impact groundwater.	Same as H Area	Same as APT's baseline. Immediate response by SRS would minimize the potential to impact groundwater.

Table 2-2. (Continued).

Resource	Current SRS Baseline	Increment above baseline of proposed H Area site	Increment above baseline of alternative AGNS site	Increment above baseline of no-action alternative[a,b,c]
Surface Water	Construction in an industrial area with established stormwater control systems	Minimal construction impacts; construction would not disturb undeveloped areas.	Lower construction impacts than H Area because of less construction at AGNS.	No effects greater than 5 percent above APT's baseline.
	Permitted process wastewater discharges	Effluent treatment would remove radioactive cobalt from process water to safe levels before discharge to Upper Three Runs. Tritium concentration in the effluent would be less than the regulatory limit of 20,000 picoCuries per liter.	Same as H Area	Radioactive process wastewater from extraction facilities would be routed from the APT site, treated, and discharged to Upper Three Runs.
	Permitted sanitary wastewater discharges	Effluent would be treated before release to Fourmile Branch. All discharges would be within permit limits. Minimal impacts expected.	Effluent would be treated before release to Lower Three Runs. All discharges would be within permit limits. Minimal impacts expected.	No effects greater than 5 percent of APT's baseline.
Air Resources				
Nonradiological constituent concentrations at the SRS and AGNS site boundaries	Concentrations vary from approximately 0 to 60 percent of applicable standards and average 25 percent.[d]	Concentrations vary from approximately 0 to 0.19 percent of applicable standards and average 0.02 percent.[e] Ozone concentrations (measured as VOCs) would be 0.19 percent of the regulatory standard of 235 $\mu g/m^3$. All other contaminant levels would be less than 0.02 percent of their respective regulatory standards.	Concentrations vary from approximately 0 to 1.7 percent of applicable standards and average 0.2 percent.[e] Ozone concentrations (measured as VOCs) would be 1.7 percent of the regulatory standard of 235 $\mu g/m^3$. All other contaminant levels would be less than 0.20 percent of their respective regulatory standards.	Diesel generator backup power would be provided by the APT facility. Therefore, no increase in nonradiological air impacts.

Table 2-2. (Continued).

Resource	Current SRS Baseline	Increment above baseline of proposed H Area site	Increment above baseline of alternative AGNS site	Increment above baseline of no-action alternative[a,b,c]
Annual radiological dose to the maximally exposed (offsite) individual (millirem). Dose limit = 10 millirem/yr.	0.05 millirem	0.02 millirem; the emission is 0.2 percent of the dose limit (CLWR targets) 0.014 millirem, 0.14 percent of the dose limit (targets of similar design)	0.15 millirem; the emission is 1.5 percent of the dose limit (CLWR targets) 0.030 millirem; 0.3 percent of the dose limit (targets of similar design)	**0.006** millirem (CLWR targets)
Waste				
Total estimated construction debris (metric tons)	N/A	385	115	No effects greater than 5 percent above APT's baseline.
Total operations waste by type (cubic meters)				
High-level	150,750 (30 years)	0 (40 years)	Same as H Area	0 (40 years)
Low-level	343,710 (30 years)	9,320 (40 years; CLWR targets); 8,720 (40 years; targets of similar design)	Same as H Area	12,800 (40 years; CLWR targets)
Hazardous or mixed	90,450 (30 years	132 (40 years)	Same as H Area	80 (40 years; CLWR targets)
Transuranic	18,090 (30 years)	0 (40 years)	Same as H Area	0 (40 years)
Impacts to Human Environment				
Aesthetics[e]	Area is not visible to and noise is not heard by offsite public. Historic and archaeological resources are not present.	Temporary increase in noise during construction phase, but it would not be heard by the offsite public. No adverse aesthetic impacts during TEF operation. Historic and archaeological resources are not present.	Temporary increase in noise during construction phase. No adverse aesthetic impacts during TEF operation. Historic and archaeological resources are not present.	No effects greater than 5 percent above APT's baseline.

Table 2-2. (Continued).

Resource	Current SRS Baseline	Increment above baseline of proposed H Area site	Increment above baseline of alternative AGNS site	Increment above baseline of no-action alternative[a,b,c]
Socioeconomics	SRS employment is assumed to decline to 10,000 employees by 2001[h], and regional growth trends are expected to continue.	Regional temporary increase of 740 jobs during peak year of construction, which is 0.29 percent of projected baseline regional employment of 258,000 jobs. The number of jobs at SRS would decline to 108 for TEF operation. The overall effects would be positive in terms of assisting to stabilize the regional employment base.	Regional temporary increase of 685 jobs during peak year of upgrades and refurbishment, which is 0.27 percent of the projected baseline regional employment of 258,000 jobs. The number of jobs at SRS would decline to 175 for TEF operation. The overall effects would be positive in terms of assisting to stabilize the regional employment base.	Approximately the same construction and operation work force as APT's baseline. No change would occur in socioeconomic impacts.
Environmental Justice	Minorities or low-income communities would not receive disproportionately high and adverse impacts.	Health effects would be minimal. Minority or low-income communities would not be disproportionately affected.	Health effects would be minimal. Because of their proximity to the AGNS site boundary, some minority or low-income communities could be disproportionately affected.	No measurable differences from APT's baseline.
Public Health				
Annual probability of fatal cancer to the maximally exposed (offsite) individual (annual fatal cancer risk from all natural causes is 3.4×10^{-3}).	9.5×10^{-8}	1.0×10^{-8} (CLWR targets) 6.8×10^{-9} (targets of similar design)	7.5×10^{-8} (CLWR targets) 1.5×10^{-8} (targets of similar design)	**3×10^{-9}** (CLWR targets)
Occupational Health				
Total estimated number of additional latent cancer fatalities (LCFs) to all involved workers from an annual dose.	0.066	1.6×10^{-3}	Same as H Area	No increase above APT's baseline.

Table 2-2. (Continued).

Resource	Current SRS Baseline	Increment above baseline of proposed H Area site	Increment above baseline of alternative AGNS site	Increment above baseline of no-action alternative[a,b,c]
Number of construction worker injuries resulting in lost work time.	NA	11	10	No increase above APT's baseline
Accidents[f,g]				
Additional LCFs in offsite population	NA			
Annual frequency / Bounding accident				
$>10^{-2}$ Hood or room fire		0.4	0.3	0
$>10^{-4}$ to $<10^{-2}$ Area fire		0.4	0.4	0
$>10^{-6}$ to $<10^{-4}$ Design-basis seismic event with fire		0.7	0.7	0.3
Impacts to Ecological Resources				
Terrestrial Ecology	The affected environment is within developed areas consisting of paved lots, graveled surfaces, buildings and trailers, providing minimal terrestrial wildlife habitat.	No physical alterations to the landscape outside of H Area but limited potential to disturb any nearby resident wildlife as a result of construction and operations noise.	Because the AGNS facility has been inactive since 1983, it may contain more wildlife than the H Area site. Construction and operations noise and human activity would have localized adverse effects on wildlife.	No additional impacts above APT's baseline.
Aquatic Ecology	No aquatic habitat within H Area boundaries; aquatic habitat adjacent to H Area boundaries (Crouch Branch and Fourmile Branch).	Construction activities would occur under best management practices to limit sedimentation in detention basins and protect streams from non-point source pollution. Operations wastewater would be discharged through NPDES-permitted outfalls. DOE would continue to comply with the permit requirements and regulatory standards to ensure maintenance of water quality in receiving streams.	Same as H Area	No additional impacts above APT's baseline.

Table 2-2. (Continued).

Resource	Current SRS Baseline	Increment above baseline of proposed H Area site	Increment above baseline of alternative AGNS site	Increment above baseline of no-action alternative[a,b,c]
Wetland Ecology	No wetland habitat within H Area boundaries; wetland habitat in the vicinity of H Area boundaries (Crouch Branch, Fourmile Branch, Upper Three Runs).	Wetlands in the Upper Three Runs watershed, including Crouch Branch, or the Fourmile Branch watershed would not be adversely affected by the construction and operation of the TEF.	Wetlands associated with Lower Three Runs would not be adversely affected by construction or operation.	No additional impacts above APT's baseline.
Threatened and Endangered Species	No threatened and endangered species within H Area boundaries.	No threatened or endangered species live or forage in H Area. There would be no adverse impact.	Same as H Area	No additional impacts above APT's baseline.

a. DOE determined that changes from the baseline of less than 5 percent are within the margin of error and **the conservatism inherent in the analyses. DOE finds that in those instances there is no measurable change from baseline and has not evaluated the impacts further.**
b. Baseline for no action includes an accelerator for production of tritium (APT) constructed on its preferred site and operated with its preferred helium-3 feedstock. The increment above baseline for no action incorporates extracting tritium from CLWR targets in the APT facility.
c. Source: **England (1998a); Willison (1998)**.
d. Concentration increments that would be less than 0.1 percent of standard for both locations are not listed.
e. Includes land use, visual resources and noise, and historical and archeological resources.
f. Events with the most additional latent fatalities in offsite public are a full-facility fire and a design-basis earthquake with a secondary fire.
g. Accidents involving targets of similar design would have substantially lower impacts.
h. The employment of 10,000 is based on actual reductions in 1995, 1996, and 1997 and a continuation of that trend through 2000. The 1998 SRS workforce was 14,130 and is expected to remain stable through at least 1999. As such, the estimate serves as a conservative lower bound assumed to ensure that the workforces associated with the construction and operation of the TEF are not underestimated relative to the SRS workforce.

2.4.1 COMPARISON OF THE PROPOSED ACTION AND THE AGNS ALTERNATIVE TO THE SRS BASELINE

In Comment M1-02, the commenter stated that there is little or no difference between the AGNS and H-Area alternatives, but that the EIS makes it look like a major difference. DOE did not intend to exaggerate the comparison of the H-Area (proposed action) and the AGNS alternatives. However, it did wish to capture the differences in environmental impacts for the decisionmaker(s) and the public. DOE has revised Section 2.4.1 starting on page 2-8 of the Draft EIS to clarify the differences between these two alternatives.

The action alternatives include the preferred alternative to construct and operate TEF in H Area (Section 2.2.1) and the alternative to upgrade and refurbish existing facilities and operate TEF at AGNS (Section 2.2.2). Table 2-2 on pages 2-3 to 2-8 compares the basic characteristics of locating TEF in H Area to those of locating it at AGNS.

One difference between the proposed H Area and alternative AGNS locations is AGNS's close proximity to non-government land and therefore its greater potential for impacting offsite individuals **near the site boundary** in case of **a normal operational or** accidental release. **This difference is considered to be minimal. As shown in the following table, additional differences include stack height and radionuclides released to the environment.**

Annual radionuclide emissions (curies) from CLWR targets and stack height at TEF at H Area and TEF at AGNS.[a]

	Annual emissions rate (curies)	
Radionuclide	**H Area**	**AGNS**
Tritium[b]	**10,000**	**14,500**
Expelled pellet material[c]	**4.2×10^{-5}**	**0.0012**
Cobalt-60[d]	**4.2×10^{-4}**	**4.2×10^{-4}**
Zirconium-95[e]	**NA**	**1.1**
Stack Height	**100 feet**	**328 feet**

a. **Smith (1997a, 1998a) and England (1998a).**
b. **Assumed to be tritium oxide.**
c. **See Table 2-3.**
d. **Smith (1998b).**
e. **Zirconium-95 would be released only during the shearing of targets necessary at AGNS.**

The quantities released at AGNS differ from those emitted at H Area because each rod would be cut three times to be placed in the AGNS furnace while full-height targets would be punctured at H Area. The shearing operation would result in higher emissions than the puncturing operation.

Should DOE discover threatened, endangered, or other sensitive resources on either potentially affected area, avoidance or other appropriate mitigation measures would be taken. Neither of the alternative sites for TEF is known to contain hazardous, toxic, or radioactive materials. Nonetheless, the potential exists that excavation-related activities could result in the discovery of previously unknown and undocumented hazardous, toxic, or radioactive materials. In the event that hazardous, toxic, or radioactive material was discovered, DOE would remove and dispose of such material in accordance with all applicable laws and regulations.

DOE has not identified any significant historic or archaeological resources at either alternative site that construction or operation of TEF could affect. However, if DOE discovered such sites during construction, it would comply with the stipulations of the Programmatic Memorandum of Agreement between DOE, the South Carolina State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation.

While processing CLWR targets, the contributions of nonradiological air constituents **at AGNS** would be 0.13 percent of the applicable standard, **and even lower for** the onsite H-Area alternative. **Similarly,** the annual radiological dose for the offsite maximally exposed individual would be 0.13 millirem higher for AGNS than H Area, but both would be well below the regulatory **annual** limit of 10 millirem from airborne releases. **Additionally, releases from processing targets of similar design would be lower than from processing CLWR targets for either alternative.**

Because of the location of AGNS, some minority or low-income communities could be disproportionately affected by radiological and nonradiological air emissions, but again impacts are expected to be minor. At the AGNS site, construction noise and activity could have localized adverse effects on wildlife, but operations would not.

Advantages of AGNS include less land disturbed, less construction waste generation, and lower construction costs. Also, the lower population density in the communities near AGNS would result in a smaller collective dose from potential accidents.

DOE has revised the Draft EIS to include advantages of the proposed H-Area site to provide a comparison to the advantages of AGNS discussed in the previous paragraph.

Advantages of the proposed H-Area site are primarily due to its close proximity to the location of the final tritium purification step in Building 233-H. This enables DOE to share common support facilities, services, and some personnel; to facilitate the transfer of tritium between the two facilities; and to use certain gas-handling processes located in H Area. Consequently the life-cycle cost of operating the TEF at this location is substantially less than AGNS.

2.4.2 COMPARISON OF THE TEF NO-ACTION ALTERNATIVE TO THE BASE CASE PROPOSED ACTION FOR THE ACCELERATOR FOR PRODUCTION OF TRITIUM (APT WITHOUT EXTRACTION CAPABILITY)

Even though the Secretary selected the APT as backup, the discussion below is retained in this Final EIS until a Record of Decision has been issued.

The impacts of incorporating tritium extraction capabilities into APT are compared to those associated with construction and operation of the APT without the tritium extraction capability. Differences between operating APT with and without TEF capabilities are identified in Table 2-3. Only CLWR targets were evaluated for the no-action alternative.

The main additions required to combine TEF and APT would **have been** the addition of the Remote Handling Area, target preparation area, storage area, and the TEF furnaces to APT. These furnaces would **have heated** CLWR targets to drive tritium from them. In addition, the TEF furnaces could **have been** used to extract the tritium from targets of similar design. The furnaces would be accommodated by the construction of a 48-foot addition along the length of one building in the APT facility. This addition would **have added** a total of 28,800 square feet on five levels, for an increase of approximately 10 percent in one APT building. Some system expansions and relocations within the building would **have been** necessary as a result of the combination of functions. However, these modifications would **have been** relatively minor in comparison with the entire APT project.

TEF at APT was designed to store up to 4,200 CLWR targets. These targets would **have been** kept in dry storage in one of the APT facility buildings. For accident analysis purposes, it **was** assumed that each CLWR rod contains a maximum of 1.5 grams of tritium. It **was** also conservatively assumed that all of the tritium in the extraction furnace and 1 percent of the tritium in the stored CLWR targets would **have been** oxidized and released in the event of either a design-basis or beyond-design-basis seismic event. The facility would **have been** designed so that both the tritium-extraction furnaces and the accelerator could **have operated** simultaneously. Operators in the APT facility would **have been** cross-trained in both TEF and APT functions. As a result, no additional personnel would **have been** expected for the combined facility.

2.4.2.1 <u>Impacts of Construction of the Combined TEF/APT</u>

The additional construction required for the combined facility would not **have required** changes either to the construction start date or the period of construction. The additional construction necessary to build the combined

Table 2-3. Comparison of operation of APT with and without extraction capability.[a]

Resource	APT without extraction capability (base case)	No action (APT with extraction capability)
Annual **Air** Releases (curies)		
Tritium **oxide**[b]	**30,000**	**35,000**
Carbon-11	**250**	**250**
Expelled pellet material[c]	NA	4.2×10^{-5}
Argon-41	**2,000**	**2,000**
Cobalt-60	NA	4.2×10^{-4}
Beryllium-7	**0.02**	**0.02**
Iodine-125	$\mathbf{2.7\times10^{-3}}$	$\mathbf{2.7\times10^{-3}}$
Public and Worker Health		
Maximally exposed (offsite) individual (MEI) dose (mrem/yr)	**0.052**	**0.058**
Annual probability of fatal cancer to MEI from normal operations	$\mathbf{2.6\times10^{-8}}$	$\mathbf{2.9\times10^{-8}}$
Total dose to population (person-rem/yr)	**2.0**	**2.2**
Annual population latent cancer fatalities (LCFs) **from air and aqueous releases**[d]	$\mathbf{1.0\times10^{-3}}$	$\mathbf{1.1\times10^{-3}}$
Uninvolved worker dose (rem/yr)	$\mathbf{1.7\times10^{-3}}$	$\mathbf{2.0\times10^{-3}}$
Involved worker dose (rem/yr)	1.0	1.0
Collective involved worker dose (person-rem/yr)	**88**	**92**
Annual collective involved worker LCFs	**0.04**	**0.04**
Accidents		
Maximally exposed (offsite) individual (rem)		
Design-basis seismic event	2.9	3.3
Beyond design-basis seismic event	3.0	5.8
Total dose to population (person-rem)		
Design-basis seismic event	5,100	5,857
Beyond design-basis seismic event	5,500	10,577
Total LCFs to population		
Design-basis seismic event	2.6	2.9
Beyond design-basis seismic event	2.7	5.3
Uninvolved worker dose (rem)		
Design-basis seismic event	150	152
Beyond design-basis seismic event	168	180

a. **Source: England (1998a)**; **Willison (1998).**
b. **The dose effects of elemental tritium are negligible compared to tritium oxide and are not included in this analysis.**
c. **Expelled pellet material resulting from puncturing CLWR targets. Source term radionuclides (with percent annual Curie content) include Se-75 (33%), Cr-51 (23%), Co-58 (13%), Fe-55 (12%), Ca-45 (10%), Ar-37 (3%), Mn-54 (2%), Ni-63 (1%), C-14 (1%), Ar-39 (1%), and trace isotopes (<1%) (Migliore, 1998).**
d. **Aqueous releases from APT are 3,000 Ci/yr of tritium, 1×10^{-4} Ci/yr of cobalt-60, 2×10^{-3} Ci/yr of chromium, and 1×10^{-3} Ci/yr of sodium-22. The tritium extraction process has aqueous releases that are less than reportable levels.**

extraction facility would **have added** less than 5 percent to the construction effort of building APT in both materials and workforce.

Construction of the combined facility would **have involved** expansion of one building and some additional equipment. The additional land required for the building footprint **was** adjacent to a planned building and already included in the APT footprint. As a result, no effects greater than 5 percent above APT's baseline would **have been** expected to the physical environment (landforms, soils, geology, hydrology, surface water, air emissions, infrastructure, waste management, historic, archaeological and visual resources, or noise).

Construction of the combination facility would **have involved** no new hazards to workers beyond those already considered for the construction of the entire APT. As a result of design efficiencies, the APT with the combination facility would **have been** constructed with approximately the same workforce and no change expected in the number of additional traffic accident fatalities or occupational injuries during construction. In addition, no change would **have occurred** in socioeconomic impacts compared to the entire APT project.

The combination facility would **have been** a small addition to the entire APT project; therefore, no impacts beyond those already considered would **have taken** place in the biological environment (terrestrial ecology, aquatic ecology, wetland ecology, threatened and endangered species).

2.4.2.2 <u>Impacts of Operation of the Combined TEF/APT</u>

Operation of the combined facility would not **have required** large changes in the operational characteristics of APT. No additional land use would **have been** required and no water beyond that already identified for separate APT and tritium extraction facilities would **have been** required. No effects on the landforms, soils, visual resources or noise from the facility beyond those already envisioned for APT would **have occurred**. Emissions of non-radiological gases to the environment would **have been** equivalent to the emissions already analyzed for APT as a whole.

This document identifies the impacts of the bounding case of storing CLWR targets, processing CLWR targets in TEF, and operating APT with the preferred helium-3 feedstock alternative. Operation of the combined facility would **have increased** emissions of radioactive gases and particulates compared to the APT baseline. The combined facility could **have been** expected to have annual **air** releases no greater than **35,000** curies of tritium **oxide; 250 curies of carbon-11; 2,000 curies of argon-41; 0.02 curies of beryllium-7; 0.0027 curies of iodine-125;** 4.2×10^{-5} curies of **expelled pellet material**; and 4.2×10^{-4} curies of cobalt-60. These releases would **have** bound all operational combinations of TEF and APT production, but in no case would the operation of the combined facilities **have produced** more than 3 kilograms of tritium per year.

Waste streams from the combined facility would **have been** very similar to those from the APT baseline with the exception of job control waste and radioactive process wastewater from TEF. The combined facility would **have produced** an additional 320 cubic meters annually of low-level solid radioactive waste and an additional 2 cubic meters annually of hazardous waste. Radioactive wastewater would **have increased** 8 percent over the APT baseline.

Cross-training of the workforce would **have resulted** in no additional workers required for the combined facility. Therefore, the estimates for occupational injuries, traffic accident fatalities, and impacts on the regional economy would be unchanged from the APT baseline. While emissions would **have increased** over the APT baseline, the relative effects on each member of the surrounding population would **have been** unchanged and the environmental justice conclusion of the Draft APT EIS would remain valid.

The diesel generator and storage tank necessary for backup power for TEF at H Area would not **have been** needed for the combined facility. The TEF furnaces **did** not require backup power, and other backup power needs would **have been** provided by the APT facility generators. Therefore, there **was** no difference between the nonradiological air impacts for the combined facility and the APT baseline alternative.

Public health impacts would **have been** higher for the combined facility than those for the baseline APT alternative due to the higher radiological source term**s** associated with **extracting** tritium **from CLWR targets**. The doses to the maximally exposed offsite individual and population for the APT/TEF combination would be **0.058** mrem/year and **2.2** person-rem/year, respectively. The estimated number of **annual** latent cancer fatalities to the general population from the combined facility is **0.0011** compared to **0.0010** for the baseline APT.

Because worker radiological dose is an administratively controlled limit, the maximum worker dose allowed at the combined TEF/APT facility would **have been** unchanged from the APT baseline facility. The estimated number of latent cancer fatalities based on the collective worker dose would remain at 0.03. APT alone would have a bigger workforce and a higher individual dose than TEF alone, so the addition of the TEF dose to the APT dose would not **have increased** the number of potential latent cancer fatalities. The uninvolved worker dose (640 meters from the facility) would **have been** higher for the combined facility due to cobalt-60 emissions from extracting CLWR targets and also from increased tritium emissions as a result of the additional TEF operations. The uninvolved worker dose would **have increased** from **1.7×10^{-3}** mrem/year for baseline APT to **2.0×10^{-3}** mrem/year for the combined facility.

Consequences of potential accidents at facilities that produce or process radioactive materials **were** driven by the amount of source material available for release to the environment. The combination facility **differed** from the baseline APT in that there **was** an increase in the amount of tritium stored in the form of CLWR targets. This additional fixed source term **resulted** in greater accident consequences for the combined facility over the APT baseline. The limiting accident scenarios for the TEF/APT combination facility **were** a large fire in the combined facility and design-basis and beyond-design-basis seismic events.

Chapter 4. Modifications – Environmental Impacts

Comment letter L3, submitted on behalf of the U.S. Public Health Service, Department of Health and Human Services, had several comments that prompted changes to the section on the impacts of operation on radiological air quality which begins on page 4-8 of the Draft EIS. The following section, *Operation* is provided to place these changes in context.

Operation (under <u>Radiological Air Quality of</u> Section 4.1.1.4, <u>Air Resources</u>) – Although many different radionuclides would be emitted as a result of normal operations for processing CLWR targets, only a few would account for essentially all of the potential dose. Annual emissions (curies) for the radionuclides that are considered the major contributors to dose from CLWR targets are presented in Table 4-5 (Smith 1997a, 1998). Tritium and **expelled pellet material** emissions result from the puncturing and processing of CLWR targets. A number of radionuclides found in the CLWR target surface crud also are released in the course of normal operations.

Table 4-5. Annual radionuclide emissions (curies) from normal processing of CLWR targets or targets of similar design at TEF in H Area.[a]

	Annual emissions rate	
Radionuclide	CLWR targets	Targets of similar design
Tritium[b]	10,000	8,500
Expelled pellet material[c]	4.2×10^{-5}	$<4.0 \times 10^{-5}$[d]
Cobalt-60[e]	4.2×10^{-4}[f]	NA[g]

a. Smith (1997a) and **England (1998b).**
b. Assumed to be tritium oxide.
c. See Table 2-3.
d. For calculation purposes $<4.0 \times 10^{-5}$ Ci is conservatively assumed to be 4.0×10^{-5}.
e. Smith (1998).
f. Includes major dose-contributing radionuclides in CLWR target crud: Co-60, Co-58, Cr-51, Fe-59, and Mn-54 (Cunningham 1996).
g. NA = not applicable. Cobalt-60 is not a component of a target of similar design assumed to be made of lithium aluminum material.

The radionuclides in the CLWR target residue recognized as potential major contributors to radiological dose include cobalt-60, cobalt-58, chromium-51, iron-59, and manganese-54 (Cunningham 1996). However, except for cobalt-60, these other radionuclides have relatively short half-lives and thus would be present in only small amounts by the time the CLWR targets were processed. Additionally, of all the radionuclides in the surface material, cobalt-60 imparts a higher dose per curie amount. Therefore, in order to represent the worst case in terms of radiological effects, the total amount of curies released from the surface crud was assumed to be all in the form of cobalt-60, thereby making the calculated dose conservative. For purposes of estimating impacts, TEF is assumed to operate 24 hours a day, 365 days a year. All radionuclide emissions resulting from TEF processes would pass through the Glovebox and Purge Stripper System and the Module Stripper System, where tritium, oxygen, helium, moisture, and some hydrocarbons would be stripped or purged through a single 100-foot stack (DOE 1997b).

Radiological emissions (Ci/yr) associated with the processing of targets of similar design at TEF in H Area are presented in Table 4-5. As with the CLWR targets, the radionuclides listed for the target of similar design represent the major dose contributors. Tritium and **expelled pellet material** emissions for these targets would be less than those for the CLWR targets. For purposes of this analysis, a target of similar design is assumed to be made of lithium-aluminum material which is ductile, unlike the ceramic getter and pellets in the CLWR targets. The tritium in these targets would remain bound in the lithium until the targets were melted in the furnace (Smith 1998). For the case of the targets of similar design, TEF is assumed to operate 24 hours a day, 365 days a year and pass through the same stripper systems and 100-foot stack, as with the processing of CLWR targets. See Section 2.2.1.1 for uranium bed information.

> Comment L3-03 asked for more detail on the function of the computer programs discussed in the following paragraph, the pertinent parameters, or a reference to this information to increase the readers understanding of dose estimation. DOE believes that the text as written contains the appropriate level of detail for most readers. DOE provided the requested information in the response to the comment and refers interested readers to that comment and response. Comment L3-05 suggested changing "determining" to "estimating" in the following modified text to clarify that emission rates are not precise at this stage in the design of TEF.

> Comment L3-10 requested a reference for the validated data set discussed on page 4-9 of the Draft EIS in the paragraph below. DOE has inserted the appropriate reference.

After **estimating** routine emission rates, DOE used the computer codes MAXIGASP and POPGASP to **predict potential** radiological doses to the maximally exposed individual, the hypothetical uninvolved worker, and the population surrounding SRS. Both codes utilize the GASPAR (Eckerman et al. 1980) and XOQDOQ (Sagendorf et al. 1982) modules which have been adapted and verified for use at SRS (Hamby 1992 and Bauer 1991, respectively)

MAXIGASP and POPGASP are both site-specific computer programs that have SRS-specific meteorological parameters (e.g., wind speeds and directions) and population distribution parameters (e.g., number of people in sectors around the Site). Meteorological data gathered at SRS from 1987 through 1991 (the most recent validated data set available) were used for the radiological dispersion modeling. The 1990 census population database **(ORNL 1991)** was used to represent the population living within a 50-mile radius of the center of SRS. **For further information see the Comment L3–03 and the DOE response in Section 1 of this Final EIS.**

> Comment L3-04 recommended that the dose numbers discussed below and listed in Table 4-6 on page 4-9 of the Draft EIS be presented on a relative basis so the reader could judge the severity of these doses in proportion to doses commonly received by individuals in the vicinity of SRS. DOE revised Table 4-6 in response to this suggestion. Also, in response to Comment L3-11, DOE has provided the reference to the statement that tritium accounts for 98 percent of the dose to the SRS worker.

Table 4-6 presents the calculated maximum radiological doses associated with routine operations of TEF. Based on the dispersion model, the maximally exposed individual was identified as being located in the northern sector at the SRS boundary, 7.4 miles from the H Area TEF location. According to these results for the CLWR targets, the maximum committed effective dose equivalent for the maximally exposed individual would be 0.02 millirem for each year of operation, well below the annual dose limit of 10 millirem from SRS atmospheric releases (40 CFR 61.92). The estimated dose to the offsite population residing within a 50-mile radius is calculated as 0.77 person-rem per year (Simpkins 1997a). For both the maximally exposed individual and the offsite population, tritium is estimated to be the highest contributor to dose, accounting for 99 percent of both the maximally exposed individual and population doses (Simpkins 1997b).

Table 4-6. Annual doses from normal radiological air emissions from H Area TEF.[a]

	Maximum dose	
Receptor	CLWR targets	Targets of similar design
MEI dose (millirem)[b]	0.02	0.014
Percent of total radiation exposure [c]	**0.006**	**0.004**
Total dose to population (person-rem)	0.77	0.66
Percent of total radiation exposure[d]	**0.0003**	**0.0003**
Uninvolved worker dose (millirem)	0.35	0.29
Percent of total radiation exposure	**0.10**	**0.08**

a. Simpkins (1997a).
b. MEI = maximally exposed individual.
c. Relative to effective dose equivalent for non-occupational sources in the vicinity of SRS (357 millirem).
d. Relative to average annual dose to the offsite population of 620,100 within a 50-miles radius of SRS (0.357 rem x 620,100 persons = 221,376 person rem).

Table 4-6 also reports a dose to the hypothetical onsite worker from annual radiological emissions. The onsite worker is located at a distance of 640 meters from the release point in the direction, as determined through modeling, of the highest dose; for TEF, this location is toward the southwest. The estimated maximum committed effective dose equivalent is 0.35 millirem for each year of operation (Simpkins 1997a). Tritium is the highest contributor to the worker dose, accounting for 98 percent of the total dose **(Simpkins 1997b)**.

Radiological doses due to the processing of the targets of similar design are determined in the same manner as doses from the CLWR targets, and are presented in Table 4-6. All the receptor doses for the targets of similar design are approximately the same as for the CLWR targets. The MEI, population, and worker doses would be 0.014 millirem, 0.66 person-rem, and 0.29 millirem, respectively, with tritium responsible for essentially all the dose.

4.1.1.5 Waste Management

This section describes the impacts of TEF construction and operations (described in Appendix A) waste management activities on the environment (described in Chapter 3) at SRS. DOE has determined that construction and operation of TEF would result in generation of several types of nonradioactive and radioactive waste.

The waste would be managed at SRS, onsite vendor-operated, or offsite treatment, storage, and disposal facilities. This analysis assumes that as much waste as possible would be treated and disposed at SRS facilities. Potential impacts to the waste management facilities are expected to be small due to existing SRS waste treatment, storage, and disposal capacities for the projected types of waste and the relatively low volumes of waste generated (Table 4-7).

DOE clarified Table 4-7 from page 4-10 of the Draft EIS as requested in Comment L3-09.

DOE incorporated waste minimization and pollution prevention factors into the TEF preconceptual and conceptual designs. Production processes were configured to minimize waste generation. This was accomplished through segregation of activities that generate radioactive and hazardous wastes, treatment to separate radioactive and nonradioactive components to reduce the volume of mixed waste, and substitution of nonhazardous materials for materials that contribute to hazardous or mixed wastes.

Table 4-7. Impacts on SRS treatment, storage, and disposal facilities from operation of proposed action for CLWR targets or targets of similar design.[a,b]

Waste facility[b]	Annual waste quantity[c]	Waste type[a,**d**]	Operating capacity	Impact of proposed action
		Pretreated waste volumes		
CIF	230 m^3 (CLWR targets) 20 m^3 (targets of similar design)	Incinerable LLRW	17,830 m^3/yr[b,e,f]	1.3 percent of capacity 0.11 percent of capacity (targets of similar design)
	2.5 m^3 0.09 m^3	Incinerable MW Incinerable HW		
Compactor	75 m^3	LLRW	3,983 m^3/yr[b]	1.9 percent of capacity
		Waste-generation and post-treatment volumes		
E-Area LAW vault	195 m^3[g]	LLRW	30,500 m^3/vault[b]	0.006 vault/yr
E-Area ILTV	35 m^3 (CLWR targets) 20 m^3 (targets of similar design)	LLRW with tritium	5,300 m^3/vault[b]	0.006 vault/yr 0.004 vault/yr
Storage building	0.6 m^3 2.5 m^3[h]	HW MW	2,618 m^3 619 m^3/building(total)[b]	<1 percent of capacity <1 percent of capacity
Three Rivers Landfill	231.5 m^3	Sanitary waste	3,592.5 m^3/day[i]	0.06 days/yr
CSWTF	770,000 gallons	Sanitary wastewater	1 million gallons/day[a]	0.8 days/yr
Effluent Treatment Facility	11,000 gallons[e]	Process wastewater	187,000 gallons per day[a]	0.06 days/yr
Burma Road Landfill	33 m^3[j]	Industrial waste	100,000 m^3/yr[b]	0.03 percent of annual capacity

a. WSRC (1997).
b. DOE (1995a).
c. These quantities cannot be compared with volumes in Appendix A which are only wastes generated. The volumes in this table include waste-generation volumes and the post-treatment volumes sent to storage and disposal facilities.
d. Waste types are described in Table 4-9.
e. All waste considered as solid feed.
f. 50 percent attainment capacity.
g. Includes post-compacted LLRW with tritium (4:1 ratio).
h. Excludes pumps oils and alcohols.
i. DOE (1995b).
j. BSRI (1997).
CIF = Consolidated Incineration Facility.
CSWTF = Central Sanitary Wastewater Treatment Facility.
HW = hazardous waste.
ILTV = intermediate-level tritium vault **disposes of low-level radioactive waste containing tritium and radiating greater than 200 millirem per hour.**
LLRW = low-level radioactive waste.
LAW = low-activity waste. **Low-level radioactive waste radiating less than 200 millirem per hour.**
MW = mixed waste.
N/A = not applicable. A new wastewater treatment facility would be constructed.

Construction – The construction of TEF would generate nonhazardous, nonradioactive wastes, including construction debris (mixed rubble, metals, plastics), and sanitary wastewater. Table 4-8 lists estimated maximum quantities of waste for construction of TEF in H Area.

DOE could use the existing Burma Road Landfill on SRS for rubble and other nonrecyclable construction debris or transport them to an offsite commercial landfill. DOE estimates a total of approximately 165 metric tons of construction debris would be generated during TEF construction.

Table 4-8. Construction waste generated from the proposed action for CLWR targets and targets of similar design.[a]

Waste type	Waste quantity for proposed action
Construction debris	165 **cubic meters**
Sanitary wastewater	3.1 million gallons
Low-level radioactive waste	0

a. Smith (1997b).

During construction, sanitary wastewater would be managed by an offsite vendor using portable restroom facilities until DOE could build permanent restroom facilities at TEF. Because the vendor would be responsible for disposing of this sanitary wastewater offsite, it would not affect SRS wastewater treatment facilities. After connection of the TEF facilities to the CSWTF, the maximum annual volume attributable to TEF construction would represent approximately **750,000 gallons (0.2 percent)** of the **CSWTF's** annual operating capacity of about 365 million gallons.

Operation – TEF operations would generate a number of nonradioactive and radioactive waste streams. In addition, some of the TEF radioactive waste would be mixed (Resource Conservation and Recovery Act [RCRA] hazardous and radioactive) waste. Because processes at TEF do not involve fission and DOE would not use materials with high atomic numbers in the extraction process, the facility would not generate high-level radioactive or transuranic wastes.

TEF operations' wastes would be generated by the extraction of tritium from irradiated targets, decontamination processes, and operation of supporting facilities. They would also be generated incidentally as a result of failed equipment, routine maintenance, and off-normal events. Table 4-9 lists the waste types generated by activity and examples of items included in each waste type.

The waste estimates in Table 4-7 are based on pre-conceptual and conceptual design information, conceptualized modes of operation, assumed levels of production, engineering judgment, waste forecasts, and waste management plans.

TEF would be able to pretreat, treat, accumulate, handle, package, and store the wastes it generated prior to shipment to a waste treatment, storage, or disposal facility. DOE would manage TEF wastes for treatment and disposal according to waste type, using SRS, onsite vendor-operated, and offsite waste treatment, storage, and disposal facilities. Table 4-7 lists the waste types and quantities destined for treatment, storage, and disposal facilities and the subsequent impact to the facility from operation of TEF in H Area.

4.3 IMPACTS OF THE NO-ACTION ALTERNATIVE

DOE has modified Section 4.3 beginning on page 4-56 of the Draft EIS. The No-Action Alternative is described in the Summary on page S-4 of this Final EIS. Text included in Section 4.3 that is in addition to the text in Section 2.4 (page 2-8 of the Draft EIS) is modified as follows. Table 4-31, which is called out in the text below, is identical to Table 2-3 and is modified as indicated in Table 2-3 on page 2-11 of this EIS.

This EIS analyzes the incremental impacts of the no-action alternative above the APT baseline. The **data prepared to support the Final APT EIS (England 1998a; Willison 1998)** contains an analysis of impacts to the physical and

Table 4-9. TEF operational waste types, generating activities, and examples.[a]

Waste type	Generating activity	Examples of waste stream items
Sanitary solid waste	Offices, change rooms	Paper
Industrial waste	Production, maintenance, housekeeping	Failed nonrecyclable equipment, expired nonhazardous chemicals
Low-level radioactive waste	Production, maintenance, decontamination, housekeeping	Personnel protective equipment, failed equipment, spent TPBARs and extraction baskets, TPBAR baseplates, furnace components, process equipment, U/Mg beds, hydride/catalyst/ zeolite beds, HEPA filters, tritiated oil, glovebox bubbler fluid
Mixed low-level **radioactive** waste	Production, maintenance, decontamination, housekeeping	Process equipment, oil/solvent rags, decontamination, cleaning, degreasing, spill clean-up and maintenance paper, products, lubricating oil and solvents, analytical laboratory/radiological control chemicals, spent fuel cells
Hazardous waste	Routine analytical, process operation, maintenance, cleaning, degreasing, and decontamination	Lubricating oil and solvents, analytical laboratory/radiological control chemicals
Mixed low-level liquid radioactive waste	Cooling water systems, radiological control analytical activities, pollution control equipment, decontamination, fluids collected in the floor drains in potentially contaminated areas	TPBAR cask/trailer decontamination, tritiated water and aqueous solutions, tritium-contaminated process cooling water, analytical laboratory/ radiological control chemicals
Sanitary wastewater	Restrooms	Wastewater
Nonradioactive process wastewater	Process cooling water	Cooling water with traces of salts, corrosion inhibitor, slimicide, dispersant; rainwater, groundwater, wastewaters

TPBAR = tritium-producing burnable absorber rod.
a. WSRC (1997).

manmade environment, the human environment, and to archaeological, historic, and ecological resources. The TEF no-action analysis is based on the **Final** APT EIS and information developed since the draft TEF EIS was issued. Table 4-31 compares the basic impacts of operating APT with and without TEF. Section 2.4 **(page 2-2 of this EIS)** discusses more fully the impacts presented in Table 4-31.

Chapter 5. Modifications – Cumulative Impacts

Chapter 5, Cumulative Impacts, has been modified to reflect changes from the Draft EIS and includes three potential new missions as identified in the text that follows. The revised analysis includes the effects of these three potential missions on air and water resources, public health, waste management, and utilities.

The counties surrounding SRS have numerous existing (e.g., an electric generating station, textile mills, paper product mills, and manufacturing facilities) and planned (e.g., Bridgestone Tire, and Hankook Polyester) industrial facilities with permitted air emissions and discharges to surface waters. Because of the distances between the SRS and the private industrial facilities, there is little opportunity for interactions of plant emissions, and no major cumulative impact on air or water quality. Construction and operation of Bridgestone Tire and Hankook Polyester facilities could affect the regional socioeconomic cumulative impacts.

DOE also has evaluated the impact from its own proposed future actions by examining impacts to resources and the human environment as described in NEPA documents related to SRS. Additional NEPA documents related to SRS that were considered in this cumulative impacts section include:

- *Final Programmatic Environmental Impact Statement for Tritium Supply and Recycling* (DOE 1995a). In addition to construction and operation of TEF, the Record of Decision (ROD) states that the preferred alternatives for tritium production are either to pursue the purchase of an existing commercial reactor, irradiation services from a commercial reactor, or to build an accelerator system. The SRS was selected as the location for an accelerator, should one be built. In addition, the existing tritium recycling facilities would be upgraded to support either option.

  Three project-level NEPA documents discussed below cover the cumulative impacts of the activities associated with the tritium supply and recycling program: an accelerator (DOE, 1999a; England 1998a; Willison 1998), commercial light water reactor (DOE 1997b), and upgrade of existing tritium recycling facilities (DOE 1997a).

- *Final Environmental Impact Statement Accelerator Production of Tritium at Savannah River Site* (**DOE, 1999a; England 1998a; Willison 1998;**). DOE has proposed **to design, build, and test critical components of an accelerator system for tritium production (APT). The preferred** accelerator design would use helium-3 target blanket material and an alternate accelerator design **would use** lithium-6 target blanket material. If an accelerator is built, it would be located at SRS. The cumulative impact analysis includes projected impacts from the helium-3 target blanket material accelerator. **The cumulative impact analysis includes data from the final EIS.**

- ***Final Environmental Impact Statement Commercial Light Water Reactor* (DOE 1999b). DOE has proposed to initiate the purchase of an existing commercial reactor (operating or partially complete) for conversion to a defense facility, or the purchase of irradiation services with an option to purchase the reactor. Either the CLWR or the APT would be selected as the primary tritium source. The project impact zone for this EIS that overlaps the TEF project impact zone is the transportation corridor within a 50-mile radius of the SRS, to the point of transfer to the TEF of irradiated targets and to the SRS Solid Waste Disposal Facility of associated low-level waste.**

  The CLWR EIS presents quantitative data for human health impacts to include impacts to the transportation crews and members of the public from moving the targets along the entire transportation corridor of approximately 500 miles from the proposed Tennessee Valley Authority nuclear plant to SRS. The human health effects within the TEF project impact zone (within the 50-mile radius of SRS) would be approximately 10 percent of the total transportation route impacts. The annual radiological dose to the public from transportation (entire route) of irradiated targets to TEF is estimated in the CLWR EIS to be 0.014 person-rem. The dose to the population within the 50-mile radius of SRS would be approximately 0.0014 person-rem. This dose represents less than 0.005 percent of the cumulative dose to the 50-mile population from airborne releases from TEF. Because of the minimal impacts of CLWR-associated transportation activities, data from that EIS is generally not included in the cumulative impact analysis in this EIS; however, low-level waste quantities associated with CLWR shipments to SRS have been included in the Waste Management section of this chapter.

- *Savannah River Site Spent Nuclear Fuel Management Environmental Impact Statement* (**DOE 1998c**). The DOE proposed action is to provide additional capability at SRS to receive and prepare spent nuclear fuel for ultimate disposal at a Federal geologic repository. Specific actions to accomplish this could include construction and operation of a transfer and storage facility; construction and operation of a treatment facility; and additional dry storage capacity.

- *Final Environmental Impact Statement Interim Management of Nuclear Materials* (DOE 1995c). DOE has begun implementing the preferred scenarios for most of the nuclear materials discussed in the Interim Management of Nuclear Materials EIS with the exception of selecting the "comparative management scenario" alternatives for the following materials: H-Canyon plutonium-239 solutions (process to oxide), Mark-16 and -22 fuels **(blending down to low-enriched uranium)**, and other aluminum-clad fuel targets (process and store for vitrification at DWPF). Data in this chapter reflect projected impacts from the preferred and comparative management scenarios.

- *Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement* (DOE 1996a). The cumulative impacts analysis discussed in this chapter incorporates from that EIS the blending **of highly enriched-uranium to 4 percent low-enriched uranium as uranyl nitrate hexahydrate**.

- ***Defense Waste Processing Facility Supplemental Environmental Impact Statement* (DOE 1994). The selected alternative in the Record of Decision (ROD) is the completion and operation of the Defense Waste Processing Facility to immobilize high-level radioactive waste at the SRS. The facility is currently in operation. However, SRS baseline data is not representative of full operational impacts. Therefore, the DWPF data is listed separately.**

- *Draft Surplus Plutonium Disposition Environmental Impact Statement* **(DOE 1998b)**. This EIS analyzes the activities necessary to implement DOE's disposition strategy for surplus plutonium. SRS is being considered in this EIS as one of four candidate sites for construction of three types of facilities for plutonium disposition. The cumulative impacts analysis in this EIS **includes** data from the draft plutonium disposition EIS, **which was issued after the Draft TEF EIS was distributed**.

- *Environmental Assessment for the Tritium Facility Modernization and Consolidation Project at the Savannah River Site* (DOE 1997a). This environmental assessment (EA) addresses the impacts of consolidating the tritium activities currently performed in Building 232-H into the newer Building 233-H and Building 234-H. Tritium extraction functions would be transferred to TEF. The overall impact would be to reduce the tritium facility complex net tritium emissions by up to 50 percent. Another positive effect of this planned action would be to reduce the amount of low-level job control waste. Effects on other resources would be negligible. Therefore, impacts from the EA have not been included in this cumulative impacts analysis.

- ***Final Environmental Impact Statement on Management of Certain Plutonium Residues and Scrub Alloy Stored at the Rocky Flats Environmental Technology Site* (DOE 1998a). DOE proposes to process certain plutonium-bearing materials being stored at the Rocky Flats Environmental Technology Site. These materials are plutonium residues and scrub alloy remaining from nuclear weapons manufacturing operations formerly conducted by DOE at Rocky Flats. Under one of the alternatives, Processing with Plutonium Separation Alternative, DOE would remove most of the plutonium from the plutonium-bearing materials in preparation for disposal at SRS, Rocky Flats, or the Los Alamos National Laboratory. Environmental impacts from this EIS are included in this section.**

The cumulative impacts analysis also includes the impacts from actions proposed in this EIS. Risks to members of the public and site workers from radiological and nonradiological releases are based on the proposed action to extract tritium from commercial light water reactor (CLWR) targets. Impacts associated with extracting tritium from targets of similar design are not discussed here because in all cases they are less than the impacts of CLWR targets.

In addition, the cumulative impacts analysis accounts for other SRS operations. Most of the SRS data (radiological and nonradiological emissions) are based on 1996 values (Arnett and Mamatey 1997), which are the most recent data available.

Temporal boundaries were defined by examining the period of influence from both the proposed action and the other actions to be included in the cumulative impact analysis.

TEF site preparation and construction are planned to begin in the first quarter of fiscal year 1999 and be completed in 2003. Startup would depend on the preferred tritium supply source. A commercial light water reactor source could begin delivering tritium to the stockpile in 2005. Operation of the tritium supply source, TEF, and tritium recycling facilities are expected to continue for 40 years. Impacts over the 40 years of operation are expected to be essentially constant. Temporal limits for new actions **are discussed below**.

Actions for interim management of nuclear materials, highly enriched uranium, **and certain plutonium residues and scrub alloy from Rocky Flats** occur over a shorter time period **than tritium extraction facilities while spent nuclear fuel activities initially occur concurrently with the other activities and are scheduled to be completed in 2035**. For example, interim management (processing) of nuclear materials is scheduled to be complete in 2006; **Rocky Flats plutonium residues and scrub alloy processing at SRS would be completed by 2004**; and receipt and preparation of spent nuclear fuel for ultimate offsite disposal is scheduled to be completed in 2035.

In addition, activities associated with storage and disposition of weapons-usable fissile materials involves expansion of the Actinide Packaging and Storage Facility (APSF) proposed in the Interim Management of Nuclear Materials EIS. The APSF is scheduled for completion in 2006. Expansion and operation activities would occur concurrently with TEF construction and operation. Activities associated with plutonium disposition involve possible construction of as many as three facilities (completed in the 2003-2006 timeframe) that would operate for approximately 10 years, or longer if new missions are considered at a later date.

Therefore, the period of interest **for cumulative impacts** is during concurrent construction of the Accelerator Production of Tritium (APT) and TEF and their operation while actions for nuclear materials, spent nuclear fuel, highly enriched uranium, and **plutonium residues/scrub alloy** are ongoing.

5.1 Air Resources

Table 5-1 compares the cumulative concentrations of nonradiological air pollutants from SRS to Federal or state regulatory standards. The SRS maximum values are the maximum modeled concentrations that could occur at ground level at the Site boundary. The data demonstrate that total estimated concentrations of nonradiological air pollutants from the SRS, including the contributions from TEF, would be below the regulatory standards at the Site boundary. The cumulative concentrations range from less than 1 percent to **59** percent of the applicable standards. The higher percentages (**54-59** percent) are for the shorter interval sulfur dioxide concentrations and the particulate concentrations and are still well within regulatory standards.

DOE also evaluated the cumulative airborne radioactive releases for dose to a maximally exposed individual at the SRS boundary. DOE included the dose attributable to Plant Vogtle (NRC 1996) in this cumulative total. The radiological emissions from Chem-Nuclear Services and Starmet CMI, Inc. are very low (SCDHEC 1995) and are not included. Table 5-2 presents the results of the cumulative radiological analysis, using 1996 data for the SRS baseline (1992 for Plant Vogtle). The cumulative dose to the maximally exposed member of the public would be **1.1×10^{-3} rem (1.1** millirem) per year, equivalent to **11** percent of the regulatory standard of 10 millirem per year (40 CFR Part 61). The approach of summing the doses to a maximally exposed individual for

Table 5-1. Estimated maximum cumulative ground-level concentrations of nonradiological pollutants (micrograms per cubic meter) at SRS boundary.[a,b]

Pollutant	Averaging time	SCDHEC ambient standard (μg/m^3)	TEF	SRS baseline (μg/m^3)	Other foreseeable planned SRS activities[c] (μg/m^3)	Cumulative concentration[d,e] (μg/m^3)	Percent of standard
Carbon monoxide	1 hour	40,000	3.6	5,014.6	**79.4**	**5,097.6**	13
	8 hours	10,000	0.45	631.8	**19.3**	**632.2**	**6**
Oxides of Nitrogen	Annual	100	5.5×10^{-3}	8.8	**4.9**	**13.7**	14
Sulfur dioxide	3 hours	1,300	0.088	690.2	**6.02**	**696.3**	**54**
	24 hours	365	1.0×10^{-3}	215.4	**1.55**	**216.9**	**59**
	Annual	80	9.0×10^{-5}	16.3	**0.12**	**16.4**	**21**
Ozone[f]	1 hour	235	0.45	NA[f]	**0.8**	1.3	<1
Lead	Max. quarter	1.5	$<1.0\times10^{-6}$	<0.01	**NA**	<0.01	<1
Particulate matter (≤10 microns aerodynamic diameter)[g]	24 hours	150	0.01	80.6	**0.16**	**80.7**	**54**
	Annual	50	9.0×10^{-5}	4.8	**0.03**	**4.8**	10
Total suspended particulates (μg/m^3)	Annual	75	1.6×10^{-4}	43.3	**0.07**	**43.3**	**58**

a. **DOE (1995a,c,d; 1997c; 1998b,c,1999b); England (1998a); Willison (1998).**
b. Hydrochloric acid, formaldehyde, hexane, and nickel are not listed in Table 5-1 because operation of TEF or other foreseeable, planned SRS activities would not result in any change to the SRS baseline concentrations of these toxic pollutants.
c. Includes Accelerator Production of Tritium, Highly Enriched Uranium, Interim Management of Nuclear Materials, Spent Nuclear Fuel**, Surplus Plutonium Disposition, and Management of Certain Plutonium Residue and Scrub Alloy** concentrations.
d. SCDHEC (1976).
e. Includes TEF concentrations.
f. Not available.
g. New NAAQS for ozone (1 hr replaced by 8 hr standard = 0.08 ppm) and particulate matter ≤ 2.5 microns (24 hr standard = 65 μg/m^3) and annual standard of 15 μg/m^3 will become enforceable during the stated temporal range of the cumulative impacts analyses.

the **seven** actions that contribute to the radiological dose, non-Federal contributions, and baseline SRS operations is an extremely conservative one because it assumes that the maximally exposed individual would occupy simultaneously the four locations that would receive the maximum doses from activities described in each EIS at the same time, a physical impossibility.

Adding the population doses from TEF, non-Federal activities, and current and projected activities at SRS could yield a total annual cumulative dose of **48** person-rem from airborne sources. The total annual cumulative dose translates into **0.023** latent cancer fatality for each year of exposure by the population living within a 50-mile radius of SRS. For comparison, 145,700 deaths from cancer due to all causes would be likely in the same population over their lifetimes.

5.2 Water Resources

At present, a number of SRS facilities discharge treated wastewater to Upper Three Runs and its tributaries and Fourmile Branch via National Pollutant Discharge Elimination System (NPDES)-permitted outfalls. These include the F and H Area Effluent Treatment Facility (ETF) and the M-Area Liquid Effluent Treatment Facility. TEF operations would generate process and sanitary wastewater streams that would be treated at ETF and the SRS Central Sanitary Wastewater Treatment Facility, respectively.

Table 5-2. Estimated average annual cumulative radiological doses and resulting health effects to offsite population in the 50-mile radius from airborne releases.

	Offsite Population			
	Maximally exposed individual (MEI)		50-mile population	
Activity	Dose (rem)	Probability of fatal cancer[a]	Collective dose (person-rem)	Latent cancer fatalities[b]
SRS baseline[c]	5.0×10^{-5}	2.5×10^{-8}	2.8	1.4×10^{-3}
Tritium Extraction Facility	2.0×10^{-5}	1.0×10^{-8}	0.77	3.9×10^{-4}
Accelerator Production of Tritium[d]	**3.7×10^{-5}**	**1.9×10^{-8}**	**1.6**	**8.0×10^{-4}**
Surplus HEU disposition[e]	2.5×10^{-5}	**1.3×10^{-8}**	0.16	8.0×10^{-5}
Interim Mgmt of Nuclear Materials[f]	**9.7×10^{-4}**	**4.9×10^{-7}**	**40**	**0.02**
Management of Spent Nuclear Fuel[g]	**1.5×10^{-5}**	**7.5×10^{-9}**	**0.56**	**2.8×10^{-4}**
Management of Plutonium Residues/ Scrub Alloy[h]	**5.7×10^{-7}**	**2.9×10^{-10}**	**6.2×10^{-3}**	**3.1×10^{-6}**
Surplus Plutonium Disposition[i]	**4.0×10^{-6}**	**2.0×10^{-9}**	**1.6**	**8.0×10^{-4}**
Defense Waste Processing Facility[j]	**1.0×10^{-6}**	**5.0×10^{-10}**	**7.1×10^{-2}**	**3.6×10^{-5}**
Plant Vogtle[k]	**5.4×10^{-7}**	**2.7×10^{-10}**	**0.042**	**2.1×10^{-5}**
Total	**1.1×10^{-3}**	**5.5×10^{-7}**	**48**	**0.023**

a. **NCRP (1993); expressed as the "probability" of a latent cancer fatality when applying the NCRP dose-to-risk conversion factor to an individual rather than a population.**
b. **Excess fatal cancers per year.**
c. **Arnett and Mamatey (1997) for MEI and population.**
d. **England (1998a); Willison (1998).**
e. **DOE (1996); HEU = highly enriched uranium.**
f. **DOE (1995c).**
g. **DOE (1998c).**
h. **DOE (1998a)**
i. DOE (1998**b**).
j. **DOE (1994)**.
k. NRC (1996).

Treated wastewater from ETF is discharged to Upper Three Runs and from the Central Sanitary Wastewater Treatment Facility to Fourmile Branch. Studies of water quality and biota downstream of these outfalls suggest that discharges from these facilities have not degraded the water quality of Upper Three Runs or Fourmile Branch (Halverson et al. 1997). Even with the addition of TEF wastewaters, ETF and the Central Sanitary Wastewater Treatment Facility would continue to meet the requirements of the SRS NPDES permit.

Depending on the volumes of radioactive, hazardous, and mixed wastes generated during environmental restoration and decontamination and decommissioning of surplus facilities, a number of waste management facilities could be built that discharge into Upper Three Runs. If APT is built, it would discharge into Upper Three Runs. New facilities or additions or modifications to existing SRS facilities would be required to comply with the NPDES permit limits that ensure protection of water quality.

Table 5-3 summarizes the estimated cumulative radiological doses to human receptors from exposure to waterborne sources downstream from SRS. Liquid effluents from the Site could contain small quantities of radionuclides that would be released to SRS streams that are tributaries of the Savannah River. The exposure pathways considered in this analysis included drinking water, fish ingestion, shoreline exposure, swimming, and boating. As discussed in Section 4.1.1.2, the preferred TEF configuration would result in minimal radiological dose to the maximally exposed individual at the SRS boundary from liquid releases. The dose from TEF liquid emissions would be minimal because

Table 5-3. Estimated average annual cumulative radiological doses and resulting health effects to offsite population from aqueous releases.

	Offsite Population			
	Maximally exposed individual (MEI)		50-mile population	
Activity	Dose (rem)	Probability of fatal cancer[a]	Collective dose (person-rem)	Latent cancer fatalities[b]
SRS baseline[c]	1.4×10^{-4}	7.0×10^{-8}	2.2	1.1×10^{-3}
Tritium Extraction Facility	(d)	(d)	(d)	(d)
Accelerator Production of Tritium[e]	**1.5×10^{-5}**	**8.2×10^{-9}**	**0.42**	**2.1×10^{-4}**
Surplus HEU Disposition[f]	None	None	None	None
Interim Mgmt of Nuclear Materials[g]	**2.4×10^{-5}**	**1.2×10^{-8}**	**0.09**	**4.5×10^{-5}**
Management of Spent Nuclear Fuel[h]	5.7×10^{-5}	2.9×10^{-8}	0.19	9.5×10^{-5}
Management Plutonium Residues/Scrub Alloy[i]	**(d)**		**(d)**	**(d)**
Surplus Plutonium Disposition[j]	**(d)**	**(d)**	**(d)**	**(d)**
Defense Waste Processing Facility[k]	**None**	**None**	**None**	**None**
Plant Vogtle[l]	5.4×10^{-5}	2.7×10^{-8}	2.5×10^{-3}	1.3×10^{-6}
Total	**2.9×10^{-4}**	**1.5**$\times10^{-7}$	**2.9**	**1.4×10^{-3}**

a. NCRP (1993); expressed as the "probability" of a latent cancer fatality when applying the NCRP dose-to-risk conversion factor to an individual rather than a population.
b. Excess fatal cancers per year.
c. Arnett and Mamatey (1997) for MEI and population.
d. Less than minimum reportable levels.
e. **England (1998a); Willison (1998); DOE (1999a)**.
f. DOE (1996); HEU = highly enriched uranium.
g. DOE (1995c).
h. **DOE (1998c)**.
i. **DOE (1998a).**
j. DOE (**1998b**).
k. **DOE (1994)**.
l. NRC (1996).

effluent from TEF would be treated at ETF. ETF processes would remove non-tritium radiological components of the waste stream. The tritium in the TEF liquid effluent sent to ETF is expected to be well below the U.S. Environmental Protection Agency's (EPA's) drinking water limit of less than 20,000 picoCuries per liter.

The estimated cumulative dose from all SRS activities to the maximally exposed member of the public from liquid releases would be **2.9**$\times10^{-4}$ rem (**0.29** millirem) per year, well below the regulatory standard of 4 millirem per year (40 CFR Part 141). Adding the population doses associated with current and projected SRS activities to the SRS baseline would increase the cumulative annual dose to **2.9** person-rem from liquid sources. This translates into **1.4×10^{-3}** latent cancer fatality for each year of exposure of the population living downstream of the SRS. For comparison, 15,300 deaths from cancer due to all causes would be likely in the population of 65,000 downstream residents over their lifetimes.

5.3 Public and Worker Health

> Text was added to Section 5.3 on page 5-6 of the Draft EIS, Public and Worker Health, to expand the discussion on the public and worker health impacts presented in Table 5-4 on page 5-7 of the Draft EIS.

Table 5-4 summarizes the annual cumulative radiological doses and resulting health effects to the offsite population and site workers from routine SRS operations, based on 1996 data and proposed DOE actions. Impacts resulting from proposed DOE actions are described in the environmental documents listed earlier. In additionto estimated radiological doses to the

Table 5-4. Estimated average annual cumulative radiological doses and resulting health effects to offsite population and facility workers.[a]

Activity	Maximally exposed individual				Offsite population				Involved workers	
	Dose from airborne releases (rem)	Dose from liquid releases (rem)	Total dose (rem)	Probability of fatal cancer[b]	Collective dose from airborne releases (person-rem)	Collective dose from liquid releases (person-rem)	Total collective dose	Latent cancer fatalities[c]	Collective dose (person-rem)	Latent cancer fatalities[c]
SRS baseline[d]	5.0×10^{-5}	1.4×10^{-4}	1.9×10^{-4}	9.5×10^{-8}	2.8	2.2	5.0	2.5×10^{-3}	164	0.066
Tritium Extraction Facility	2.0×10^{-5}	(e)	2.0×10^{-5}	1.0×10^{-8}	0.77	(e)	0.77	3.9×10^{-4}	4.0	1.6×10^{-3}
Accelerator Production of Tritium[f]	**3.7×10^{-5}**	**1.5×10^{-5}**	**5.3×10^{-5}**	**2.6×10^{-8}**	**1.6**	**0.42**	**2.0**	**1.0×10^{-3}**	**88**	**0.035**
Surplus HEU disposition[g]	2.5×10^{-6}	(e)	2.5×10^{-6}	1.3×10^{-8}	0.16	(e)	0.16	8.0×10^{-5}	11	4.4×10^{-3}
Interim Mgmt of Nuclear Materials[h]	**9.7×10^{-4}**	**2.4×10^{-5}**	**9.9×10^{-4}**	**5.0×10^{-7}**	**40**	**0.09**	**40**	**0.02**	**127**	**0.051**
Management of Spent Nuclear Fuel[i]	1.5×10^{-5}	5.7×10^{-5}	7.2×10^{-5}	3.6×10^{-8}	0.56	0.19	0.75	3.8×10^{-4}	55	0.022
Management Plutonium Residues/ Scrub Alloy[j]	**5.7×10^{-7}**	**(e)**	**5.7×10^{-7}**	**2.9×10^{-10}**	**6.2×10^{-3}**	**(e)**	**6.2×10^{-3}**	**3.1×10^{-6}**	**8.0**	**3.2×10^{-3}**
Surplus Plutonium Disposition[k]	**4.0×10^{-6}**	**(e)**	**4.0×10^{-6}**	**2.0×10^{-9}**	**1.6**	**(e)**	**1.6**	**8.0×10^{-4}**	**561**	**0.22**
Defense Waste Processing Facility[l]	**1.0×10^{-6}**	**0**	**1.0×10^{-6}**	**5.0×10^{-10}**	**7.1×10^{-2}**	**0**	**7.1×10^{-2}**	**3.6×10^{-5}**	**120**	**0.048**
Plant Vogtle[m]	5.4×10^{-7}	5.4×10^{-5}	5.5×10^{-5}	2.7×10^{-8}	0.042	2.5×10^{-3}	0.045	2.2×10^{-5}	NA	NA
Total[n]	**1.1×10^{-3}**	**2.9×10^{-4}**	**1.4×10^{-3}**	**7.0×10^{-7}**	**48**	**2.9**	**50**	**0.025**	**1,138**	**0.45**

a. Collective dose to the 50-mile population for atmospheric releases and to the downstream users of the Savannah River for aqueous releases.
b. NCRP (1993); expressed as the "probability" of a latent cancer fatality when applying the NCRP dose-to-risk conversion factor to an individual rather than a population.
c. Incidence of excess fatal cancers.
d. Arnett and Mamatey (1997) for 1996 data for MEI and population. Worker dose is based on 1997 data (WSRC 1998).
e. Less than minimum reportable levels.
f. **England (1998a); Willison (1998); DOE, (1999a)**.
g. DOE (1996); HEU = highly enriched uranium.
h. DOE (1995b).
i. **DOE (1998c)**.
j. **DOE (1998a)**.
k. DOE (**1998b**).
l. **DOE (1994)**.
m. NRC (1996).

hypothetical maximally exposed individual and the offsite population, Table 5-4 lists potential latent cancer fatalities for the public and workers due to exposure to radiation.

The radiation dose to the maximally exposed offsite individual from air and liquid pathways is estimated to be 1.4×10^{-3} rem (1.4 mrem) per year, which is well below the applicable DOE regulatory limits (10 mrem per year from the air pathway, 4 mrem per year from the liquid pathway, and 100 mrem per year for all pathways). The total population dose for current and projected activities of 50 person-rem translates into 0.025 additional latent cancer fatality for each year of exposure for the population living within a 50-mile radius of the SRS. As stated in Section 5.1, for comparison, 145,700 deaths from cancer due to all causes would be likely in the same population over their lifetimes.

The annual radiation dose to the involved worker population would be 1,138 person-rem. The largest contributor to the dose is Alternative 3B in the Surplus Plutonium Disposition EIS. Specifically, the dose is associated with the operation of a plutonium disassembly and conversion facility that could be sited at SRS. It also should be noted that dose to the individual worker will be kept below the regulatory limit of 5,000 mrem per year (10 CFR 835). In addition, as low as reasonably achievable (ALARA) practices help maintain worker doses below DOE's administrative control level of 2,000 mrem per year and facility. SRS-specific administrative control levels are as low as 700 mrem per year.

5.4 Waste Generation

Table 5-5 lists cumulative volumes of high-level, low-level, transuranic, hazardous, and mixed wastes that the SRS would generate, based on the 30-year expected waste forecast (WSRC 1994) which includes tritium recycling waste. The waste forecasts for TEF and **other proposed activities** are included in the estimates. The 30-year expected waste forecast is based on operations and the following assumptions: secondary waste from DWPF, In-Tank Precipitation, and Extended Sludge Processing operations as described in the DWPF EIS; high-level waste volumes based on the selected option for the F-Canyon Plutonium Solutions EIS and the Interim Management of Nuclear Materials at SRS EIS; some investigation-derived wastes handled as hazardous waste per Resource Conservation and Recovery Act (RCRA) regulations; purge water from well sampling handled as hazardous waste; and continued receipt of small amounts of low-level waste from other DOE facilities and nuclear naval operations. Amounts of waste generated from decontamination and decommissioning and planned environmental restoration projects are also included in the waste forecast. The estimated quantity in this forecast of waste from operations during the next 30 years is 603,000 cubic meters. In addition, environmental restoration and decontamination and decommissioning activities identified in the 30-year forecast would produce an additional 712,000 cubic meters (WSRC 1994; Hess 1995). **Other proposed activities that were not included in the 30-year expected waste forecast** (exclusive of decontamination and decommissioning) would add **211,705** cubic meters. Therefore, the total amount of waste from SRS activities exclusive of TEF is estimated to be **1,526,705** cubic meters. **It is anticipated that SRS will have the capacity to handle the total amount of projected waste.**

As stated in Section 4.1.1.5, low-level waste would be generated from TEF operations activities. Mixed and hazardous wastes would be generated from TEF maintenance activities. High-level and transuranic waste would not be generated at TEF. The total waste volume associated with TEF activities (excluding decontamination and decommissioning) would be **9,430** cubic meters. **The TEF post-treatment waste volume would require less than 1 percent of the low-activity waste and intermediate-level tritium waste vault disposal capacities per year. TEF hazardous and mixed waste also would require less than 1 percent of their respective storage capacities at SRS.**

The Three Rivers Solid Waste Authority Regional Landfill at SRS is being built for the

Table 5-5. Estimated life-of-project waste disposal volumes from SRS projected activities (cubic meters).

Waste Type	**SRS projected activities[a,b]**	ER/D&D[c]	TEF	**Other proposed activities[c]**	Total
High-level	150,750	0	0	**11,032**	**161,782**
Low-level	343,710	132,000	**9,300**	**186,653**	**671,663**
Hazardous/mixed	90,450	575,180	**130**	**5,030**	**670,790**
Transuranic	18,090	4,820	0	**8,990**	**31,900**
Total	603,000	712,000	**9,430**	**211,705**	**1,536,135**

a. Sources: WSRC (1994); Hess (1995).
b. Based on a total 30-year expected waste generation forecast, **but does not include Environmental Restoration and Decontamination and Decommissioning activities.**
c. **Life cycle waste associated with reasonably foreseeable future activities such as APT, spent nuclear fuel management, highly-enriched uranium blend-down activities, Rocky Flats plutonium residues, surplus plutonium disposition, and CLWR-associated waste.**

disposal of nonhazardous and nonradioactive solid wastes from the SRS and eight South Carolina counties. This municipal solid waste landfill is intended to provide modern (Subtitle D) facilities for landfilling solid wastes while reducing the environmental consequences associated with construction and operation of multiple county-level facilities (DOE 1995b). It was designed to accommodate combined SRS and county solid waste disposal needs for at least 20 years, with a projected maximum operational life of 45 to 60 years (DOE 1995b). The landfill is designed to handle an average of 1,000 tons per day and a maximum of 2,000 tons per day of municipal solid wastes. The SRS and eight cooperating counties had a combined generation rate of 900 tons per day in 1995. The Three Rivers Solid Waste Authority Regional Landfill **began accepting waste on July 1, 1998.**

TEF would not generate large volumes of radioactive, hazardous, or solid wastes and would have little impact on existing or planned capacities of SRS waste storage and management facilities.

5.5 Utilities and Energy

Table 5-6 lists the cumulative consumption of electricity from SRS activities. The values are based on annual consumption estimates. This would be a significant increase in electricity usage at SRS. Because the source of this electricity would be dispersed across the electric grid that serves SRS, DOE cannot estimate site- specific impacts from increased electricity requirements. The estimated annual electricity consumption by TEF (20,600 megawatt-hours) would be small compared to existing site electricity usage.

Table 5-6. Estimated average annual cumulative electrical consumption.

Activity	Electricity consumption (megawatt-hours)
1993 SRS usage[a]	660,000
Tritium Extraction Facility[b]	20,600
Accelerator Production of Tritium[c]	3,100,000
Defense Waste Processing Facility[d]	32,000
Surplus HEU disposition[e]	5,000
Interim Management of Nuclear Materials[f]	140,000
Management of Spent Nuclear Fuel[g]	**23,600**
Management Plutonium Residues/Scrub Alloy[h]	**9,800**
Surplus Plutonium Disposition[i]	**38,000**
Total estimated annual consumption	**4,029,000**

a. DOE (1995e).
b. Vozniak (1997).
c. **England (1998a); Willison (1998)**.
d. DOE (1994).
e. DOE (1996); HEU = highly enriched uranium.
f. DOE (1995c).
g. **DOE (1998c)**.
h. DOE **(1998a)**
i. DOE (**1998b**).

5.6 Socioeconomics

DOE did not revise the section on socioeconomics (Section 5.6, page 5-9 in the Draft EIS). Although processing of plutonium residues from Rocky Flats Environmental Technology Site (DOE 1997c) and construction and operation of one to three facilities for surplus plutonium disposition (Pit Conversion Facility, Immobilization Facility, and a Mixed-Oxide Facility) at SRS (DOE 1998d) may result in a slight increase in regional employment, these actions should not have a major impact on regional economy. The additional jobs associated with plutonium management and disposition would likely offset potential reductions in the SRS workforce. Data for these actions have not been analyzed because differences identified would be less than the precision of the measurement and would not change the conclusions drawn on the cumulative socioeconomic effects.

Appendix B. Modifications – Accident Analysis

Two references in Appendix B were replaced with current revisions. One reference was deleted because at the time of its publication (1993), it was considered unclassified controlled nuclear information.

Patel (1996) was changed to Patel (1997). The new reference is:

Patel, S. M., 1997, *Hazardous Evaluation Tables for the Commercial Light Water Reaction-Tritium Extraction Facility (U)*, S-CLC-00525, Revision B, Westinghouse Savannah River Company, Aiken, South Carolina, December.

Mangiante (1997) was changed to Mangiante (1998). The new reference is:

Mangiante, W. R., 1998, *Hazard Assessment Document Commercial Light Water Reactor-Tritium Extraction Facility*, Revision 2, Westinghouse Savannah River Company, Aiken, South Carolina, October.

East (1997) has been deleted.

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DOE (U.S. Department of Energy), 1998**b**, *Draft Surplus Plutonium Disposition Environmental Impact Statement*, DOE/EIS-0283D, Office of Fissile Materials Disposition, Washington, D.C.

DOE (U.S. Department of Energy), 1998c, *Draft Environmental Impact Statement for Savannah River Site Spent Nuclear Fuel Management*, Savannah River Operations Office, Aiken, South Carolina, July.

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INDEX

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Aparajita S. Morrison, CHMM	B.S., Health Physics, 1985	Prepared occupational and public health and environmental justice sections of Chapter 4, and cumulative impacts in Chapter 5	2 years preparing NEPA documents; 11 years in environmental and occupational protection
James L. Oliver	B.S., Biology (Fisheries), 1971	Reviewer of sections on aquatic ecology, surface water, and wetlands in Chapter 4; author of No-Action Alternative section of Chapter 4	13 years preparing NEPA documents; 26 years in environmental research and impact assessment

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James S. Willison, PE, CHP	M.S., Nuclear Engineering, 1982 B.S., Nuclear Engineering, 1980	Prepared accident analysis sections of Chapter 4	1 year preparing NEPA documents; 13 years of accident analyses at nuclear facilities; health physics and radiological engineering
Paul F. Wise, CEA, CHMM	M.S., Biology, 1984 B.S., Biology, 1982	Prepared surface water sections of Chapter 4	2 years preparing NEPA documents; 14 years in environmental, water quality, waste management, and environmental audits
Philip L. Young, CHP	M.S., Health Physics, 1989 B.S., Radiation Health, 1988	Reviewed public and worker health and safety, air resources, environmental justice, and cumulative impacts sections	6 years preparing NEPA documents; 10 years experience in environmental health physics and environmental impact assessment

OCI REPRESENTATION STATEMENT

Contract No. DE-AM04-97AL77613

Task Order No. DE-AT04-97SR22040

Construction and Operation of a Tritium Extraction Facility
at the Savannah River Site
Environmental Impact Statement

I hereby certify (or as a representative of my organization, I hereby certify) that, to the best of my knowledge and belief, no facts exist relevant to any past, present, or currently planned interest or activities (financial, contractual, personal, organizational or otherwise) which relate to the proposed work and bear on whether I have (or the organization has) a possible conflict of interest with respect to (1) being able to render impartial, technically sound, and objective assistance or advice, or (2) being given an unfair */ competitive advantage.

Signature: ______________ Date: 2/25/98

Name: Dean R. Sackett, Jr. Organization: Halliburton NUS Corporation

Title: Vice-President and General Manager

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*/ An unfair competitive advantage does not include the normal flow of benefits from the performance of this contract.